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Virtual Team Performance in a Highly-Competitive Environment — Source link

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VIRTUAL TEAM PERFORMANCE IN A HIGHLY-COMPETITIVE ENVIRONMENT

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Abstract

In this paper, we empirically validate a version of the *IMOI model* (Ilgen, Hollenbeck, Johnson, & Jundt, 2005), adapting it to investigate virtual team performance in a highly competitive environment. Our hypotheses are tested using structural equation modeling across time periods with data obtained from 606 professional online gaming teams belonging to the European Electronic Sports League. The findings validate the hypothesized IMOI model, and demonstrate the effects of anticipated emotions on shared motivation of team members. The results contribute to theory and have significant implications for the management of geographically-distributed work groups.

Keywords: virtual team performance, IMOI model, longitudinal structural equation model

Introduction

Consistent with the importance of team-based work structures in organizations (Kozlowski & Ilgen, 2006), scholars have conducted extensive research to understand how and why teams achieve desired outcomes (Bagozzi & Dholakia, 2002; LePine, Piccolo, Jackson, Mathieu, & Saul, 2008). Not surprisingly, a recent literature review has identified more than 130 models and frameworks of team performance (Salas, Stagl, Burke, & Goodwin, 2007).

As a consequence of the decentralization and globalization of work processes, many organizations employ virtual teams with geographically dispersed members, who coordinate their activities using information and communication technology (Gibson & Cohen, 2003; Hertel, Geister, & Konradt, 2005). Despite its growing importance, relatively little is known about the elements that determine and influence virtual team performance. Prior research has identified the importance of social factors (e.g., Peters & Karren, 2009), task-related factors (e.g., Lipnack & Stamps, 2000) and communication (e.g., Maznevski & Chudoba, 2000). However, studying these factors within an integrated model has proved difficult because of their diversity, and the difficulties associated with collecting data from virtual teams (Lin, Standing, & Liu, 2008).

To fill this lacuna, the present study develops an explanatory model of virtual team performance, using an *Input-Process-Emergent States-Output-Input* framework of analysis. Initial inputs are represented by team's demographic characteristics, such as size, tenure and heterogeneity; team processes are characterized by intra-team communication and cohesion; emergent states include strategic consensus and joint intentions; outcomes are measured through expected and actual team performance; and the final input element is represented by past performance. This model also investigates the influence of motivational (via desire to perform) and rational (through shared goals) dimensions of strategic consensus on joint behavioral intentions, and the influence of anticipated emotions on motivation.

Team performance models

The original input-process-outcome framework (McGrath, 1964) was criticized for failing to distinguish between the mediating factors that transmit the influence of team inputs to outcomes (Ilgen, et al., 2005). Marks, Mathieu and Zaccaro (2001) addressed this issue by describing mediating mechanisms which they named 'emergent states.' Kozlowski, Gully, Nason and Smith (1999) further augmented this analysis by arguing that team functioning changes qualitatively as a result of performance feedback. Ilgen et al. (2005) built on these contributions and theorized an input-mediator-output-input (IMOI) model, explicating the cyclical nature of team functioning. Furthermore, an important issue has been to identify and select appropriate performance indicators (Mathieu, Maynard, Rapp, & Gilson, 2008). Team performance is context-specific and can vary greatly not only between studies, but also among teams considered within the same study if the teams examined belong to different organizations.

The present study proposes and tests a model of virtual team functioning based on the IMOI framework (see Figure 1). In order to eliminate biases associated with variability across organizations, we investigated the functioning of professional online gaming teams that function within the same competitive environment.

Input factors

Our proposed model includes two categories of inputs—*team demography*, i.e., its size, tenure and heterogeneity (e.g., Eisenhardt & Schoonhoven, 1990; Michel & Hambrick, 1992), and *past team performance* (Kozlowski et al., 1999).

Prior research revealed that team size creates complex, and oftentimes contradictory, effects (Shaw, 1981). A larger team has access to a bigger pool of cognitive resources, which can improve its knowledge, creativity and performance (e.g., Bechtoldt, De Dreu, & Nijstad,

2007). Yet, size can impact communication and cohesion negatively (e.g., Eisenhardt & Schoonhoven, 1990). Hoffmann and Meyer (1961) found that large teams experience difficulties in reaching consensus, affecting team cohesion negatively. Zenger and Lawrence (1989) reported a negative relationship between team size and communication frequency, finding that communication in larger teams is more structured and constrained, requiring formal mechanisms.

Cultural heterogeneity and geographical dispersion of virtual teams also contribute adversely to communication and cohesion practices (Lin et al., 2008). Team members seldom meet face-to-face, using instead electronic communication technologies to coordinate their work. Not surprisingly, members of smaller teams participate more actively in team activities, are more committed to their team, and have greater awareness of shared strategic goals (Bradner, Mark, & Hertel, 2005). Thus, we hypothesize:

Hypothesis 1: Team size will have *negative impacts* on (a) intra-team communication, and (b) team cohesion.

Previous studies have demonstrated the positive influences of team tenure. Eisenhardt and Shoonhoven (1990, p. 509) posited that team members "who have a history together have probably learned how to get along and communicate with each other." According to Michel and Hambrick (1992), longer tenure leads to cohesion and shared values. These aspects are especially relevant for virtual teams, where convergence of members' values, beliefs and patterns of communications may require longer time than in the case of face-to-face teams. Thus:

Hypothesis 2. Team tenure will have *positive impacts* on (a) intra-team communication and (b) team cohesion.

In virtual teams, heterogeneity among members provides a larger pool of complementary skills, capabilities, resources and knowledge (Wong & Burton, 2000). Functional heterogeneity has been found to have a direct impact on team performance (Peters

& Karren, 2009). Thus, although some prior studies have found negative effects of heterogeneity in the face-to-face context (e.g., Wagner, Pfeffer, & O'Reilly, 1984), we posit that virtual team heterogeneity influences positively both intra-team communication and cohesion (see also Bowers, Pharmer, & Salas, 2000, for a similar view).

Hypothesis 3. Team heterogeneity will have *positive impacts* on (a) intra-team communication and (b) team cohesion.

The final stage in the IMOI model is feedback, which represents cyclical team functioning (Ilgen et al., 2005). Because a team is seldom constituted only for a single project, its members have the opportunity to learn from past performance, with past outcomes becoming inputs for the next task (Han & Williams, 2008). Prior research suggests that the influence of past performance feedback on team's functioning is more complex than the impact of other input variables such as demography. For instance, Bateman and Zeithaml (1989) argued that team's past track record creates a psychological context constraining current and future decisions and actions. In our model, past team performance is expected to have a direct effect not only on team processes, but also on emergent states such as strategic consensus, and on its capacity to predict future performance. Supporting this view, studies have investigated the direct link between past and present team performance and have found a positive association between them (e.g., Passos & Caetano, 2005). Specifically, we hypothesize:

Hypothesis 4. Past performance will have *positive impacts* on (a) intra-team communication; (b) team cohesion; (c) strategic consensus; (d) expected team performance; and (e) actual team performance.

Team processes

A number of prior studies have identified intra-team communication and cohesion as the two important processes that can significantly influence team performance both directly

and through mediation between the team's demography and its performance (Eisenhardt & Schoonhoven, 1990; Michel & Hambrick, 1992; Smith , Smith, Olian, Sims, O'Bannon, & Scully, 1994).

Team members use communication to develop shared meanings of their environment and tasks. Group interactions crystallize the values, norms and shared mental models fostering strategic consensus (Rapert, Velliquette, & Garretson, 2002; Stewart & Johnson, 2009; Frazier et al. 2010). The importance of communication has been repeatedly emphasized by prior virtual team research (e.g., DeSanctis & Monge, 1999; Hertel et al., 2005), as a facilitator of interpersonal relationships between team members and as a catalyst of virtual team development processes (Maznevski & Chudoba, 2000; Robey, Khoo, & Powers, 2000). Communicating and exchanging information also improves coordination, which is expressed through group cohesion and shared goals (Baker, 2002; Lin et al., 2008; Tekleab, Quigley, & Tesluk, 2009). This suggests a positive relationship between intra-team communication and team cohesion, leading us to hypothesize:

Hypothesis 5. Intra-team communication will have *positive impacts* on (a) team cohesion and (b) strategic consensus.

Team cohesion (Kozlowski & Ilgen, 2006) represents a multifaceted phenomenon and is defined as "attraction to the group, satisfaction with other members of the group, and social interaction among the group members" (O'Reilly, Caldwell, & Barnett, 1989, p. 22). Team cohesion allows group members to communicate more effectively to coordinate their efforts (Evans & Jarvis, 1980).

Furthermore, virtual team research has emphasized that social factors such as relationship building, cohesion and trust, are crucial for the effectiveness of virtual teams (e.g., Gillam & Openheim, 2006; Lin et al., 2008). Previous studies identified the positive outcomes of team cohesion, such as enhanced motivation, better decisions, more open

communication and higher satisfaction among team members (Andrews, Kacmar, Blakely, & Bucklew, 2008; Warkentin & Beranek, 1999). Therefore:

Hypothesis 6. Team cohesion will have a *positive impact* on strategic consensus.

Emergent states

Emergent states appear as a result of repeated team processes representing "cognitive, motivational and affective states [that are] … dynamic in nature and vary as a function of team context, inputs, processes, and outcomes" (Marks et al., 2001, p. 357). Kozlowski and Ilgen (2006) classified emergent states into three main categories: cognitive (e.g. strategic consensus), affective/motivational, and behavioral.

Strategic consensus is defined as the shared understanding of strategic priorities among team members (Kellermanns, Walter, Lechner, & Floyd, 2005), representing the outcome of a decision-making process (Knight, Pearce, Smith, Olan, Sims, Smith, & Flood, 1999; Whyte, 1989). However, existing studies fail to adequately explain how group decisions become energized and what motivational elements induce the intention to act (Bagozzi, 1992). Relatedly, Floyd and Wooldridge (1992) defined strategic consensus as a combination of cognitive and emotional dimensions, where the cognitive side is best described by shared goals, and the emotional aspect is represented by shared desires.

The motivational role of desires in goal-directed behavior has been examined by Perugini and Bagozzi (2002), while Bagozzi and Dholakia (2002) demonstrated that positive and negative anticipated emotions have a significant effect on desire to enact behavior, which further influences joint behavioral intentions in virtual communities.

In our model, we combine the definition of strategic consensus developed by Floyd and Wooldridge (1992) with the empirical model tested by Bagozzi and Dholakia (2002), considering strategic consensus to be a bi-dimensional construct that includes a rational-cognitive dimension, operationalized through shared goals to perform, and an emotional-

motivational dimension, operationalized through a shared desire to perform. We also consider the role of positive and negative anticipated emotions on shared desire to perform as reflected in the following hypotheses:

Hypothesis 7. (a) Positive anticipated emotions will have a *positive impact* and (b) negative anticipated emotions will have a *negative impact* on shared desire to perform.

Prior research has identified a direct positive link between strategic consensus and firm performance using correlation analysis (Dess, 1987; Iaquinto & Fredrickson, 1997). However, a number of studies (e.g., Dess & Priem, 1995; Wooldridge & Floyd, 1990) have challenged this result, arguing that additional variables should be included as mediators between strategic consensus and performance. In line with Bagozzi and Dholakia (2002), we operationalize this mediator element through "we-intentions to perform," defined as "an implicit or explicit agreement between the participants to engage in joint action' (Tuomela, 1995, p. 2). Therefore:

Hypothesis 8. (a) Shared desire to perform and (b) shared goals to perform will have *positive impacts* on we-intentions to perform.

Taking the dual nature of strategic consensus considered in this study into account, hypotheses H4c, H5b and H6 are reformulated:

Hypothesis 4c: Past performance will have *positive impacts* on (1) shared goals to perform and (2) shared desire to perform.

Hypothesis 5b: Intra-team communication has *positive impacts* on (1) shared goals to perform and (2) shared desire to perform.

Hypothesis 6: Team cohesion will have *positive impacts* on (A) shared goals to perform and (B) shared desire to perform.

Considering the role of we-intentions, the joint commitment to attain shared group goals characterized by this construct mediates the relationship between strategic consensus and team outcomes (Dess & Priem, 1995; Wooldridge & Floyd, 1990). A salient effect of we-

intentions is the mutual cooperation and coordination among group members (Tuomela & Tuomela, 2005). Coordination constitutes the degree of joint effort realized by team members to manage collective resources and the extent to which the work activities of team members are logically consistent and coherent (Pinsonneault & Caya, 2005). Several studies have associated coordination with positive virtual team performance (Johansson, Dittrich, & Juustila, 1999; Lin et al., 2008; Lin 2010; Maznevski & Chudoba, 2000). Therefore, we hypothesize:

Hypothesis 9. We-intentions to perform will have a *positive impact* on expected team performance.

Output

Previous studies have operationalized team output through a multitude of performance measures that can be classified into three main categories (Mathieu et al., 2008): (1) organizational-level performance, (2) team performance behavior and outcomes, and (3) role-based performance. The use of organizational measures is based on Hambrick and Mason's (1984) 'upper-echelon theory,' which states that top management team's performance is related to organizational performance. However, such an approach neglects the existence of other internal and/or external factors that can influence performance, sometimes in opposition to the top management team's effectiveness. The comparability of such findings is also hindered because organizational performance is context-specific (Mathieu et al., 2008).

Role-based performance studies measure the extent to which team members have the necessary capabilities to perform their jobs ((Mathieu et al., 2008; Welbourne, Johnson, & Erez, 1998). This analytical approach is, in our opinion, too fragmented to measure the final outcome of work groups, having many similarities with team demographic studies. In this paper, team performance is considered as the final outcome of team processes, having both a *subjective* (expected performance) and *objective* (actual performance) dimensions.

The existing literature does not take into account the relationship between expected and actual team performance. However, the capacity to accurately predict the future outcome of a joint activity or task, can significantly improve team effectiveness, by providing members with a shared mental model of its actual performance. The notion of team mental models was originally developed by Cannon-Bowers, Salas and Converse (1990), based on cognitive psychology These models can be considered as organized knowledge frameworks that allow individuals to describe, explain and predict behavior (Norman, 1983). Within groups, knowledge frameworks are shared among members, who become capable of anticipating the actions of their team mates and to coordinate their own behaviors, especially when time and circumstances do not permit overt, lengthy communication and strategizing among team members during task performance (Lim & Klein, 2006; Marks, Zaccaro, & Mathieu, 2000).

Expected team performance can be considered a type of shared mental model, which permits team members to adjust their behavior, effectively identify and use necessary resources, and collaborate with others to achieve shared strategic goals. In addition, by repeatedly comparing shared strategic goals with expected team performance, members can introduce corrections in team processes to improve the actual performance (Jackson, 2000). The effectiveness of this feedback loop is conditioned on the accuracy of shared mental models regarding expected team performance and the means to achieve it (Lim & Klein, 2006). Previous studies have found the accuracy of a team's mental models to influence the quality of its decision-making and performance (Langfred, 2000; Lim & Klein, 2006). By measuring the accuracy of mental models as a convergence between the mental models of experts and those of team members, Lim and Kim (2006) found that mental model accuracy is instrumental for team's performance. In this study, we use the same method, and posit:

Hypothesis 10. Expected team performance will have a *positive impact* on actual team performance.

As discussed earlier, most empirical studies are confronted with significant limits in assessing and comparing the performance of various teams or organizations. These limitations stem from the complex nature of many organizations, and from the specificity of various competitive environments. Since teams are embedded within organizations, most studies define organizational performance as a direct effect of team activity, neglecting other factors that may influence actual performance. In fact, these studies equate team performance with organizational performance, although in modern competitive environments there are many other factors that can enhance, or mitigate, the effects of team performance on organizational performance.

Using virtual teams of professional online gamers as research units, we attempt to eliminate this type of bias, because investigated teams are directly embedded in one specific competitive environment and share the same competitive rules. This allows the elimination of perverse effects of other organizational factors or structures, and provides more direct insights into the determinants of actual team performance.

Research methodology

Study population

In order to empirically validate the proposed model, we collected primary and secondary data. In the first stage, an extensive literature review was conducted to identify relevant empirical scales used in other studies. In the second stage, primary data were collected from professional computer gaming teams. A computer gaming team is considered professional if it is listed and plays in international gaming leagues. Among these leagues, the most important one in Europe is the Electronic Sports League (ESL, www.esl-europe.net) with more than 2,000,000 registered members, 600,000 teams, and approximately 4.2 million matches played per year. This study was conducted in cooperation with ESL Europe, and

included professional teams with stable structures during the season of interest, with specified objectives, strategies and training.

Data Collection and Sample

Primary data were collected in three phases. First, four focus group sessions were conducted with three professional virtual gaming teams, each consisting of five members, and another session with three virtual gaming league organizers. The objective of these discussions was to gain a better understanding of the competitive gaming environment, and to clarify the concepts and measures used in this study. The focus groups were based on an interview guide and we used a dual moderator approach to ensure coverage of all topics. Using the information collected during these focus groups, a first draft of the questionnaire was created. This questionnaire was tested on ten virtual gaming teams consisting of 50 players. Based on their feedback, the questionnaire was improved.

Second, quantitative data were collected via a web-based survey, made available online approximately two months before the start of the European gaming season. Overall, during our data collection, about 2,400 teams played in the ESL professional leagues that represent our population. Teams were invited to voluntarily participate in our study using messages and announcements posted on ESL's homepage and assured confidentiality. No incentives were given to complete the survey in order to avoid bias. Each team was asked to designate a key informant, whom they considered the most suitable to answer questions about the team and its performance. A total of 1,082 teams participated in our study. Survey responses were saved and returned to the whole team asking for validation of their key informant's evaluation (Seidler, 1974). Of these respondents, seventeen teams (2.8%) provided changes. After verifying the participation of these teams in the professional gaming league, the sample was reduced to 651 teams. From these 651 participating teams, only 606 provided complete and usable questionnaires resulting in a net response rate of almost 25%.

97.4% of participants are male and the mean age is 19.8 years (SD = 4.9 years). The methodology applied to calculate the effective response rate follows the guidelines presented in Baruch and Holtom (2008).

Third, at the end of the gaming season, approximately six months after the survey, we obtained and analyzed secondary data about teams' structure and performance published on the ESL website, to decrease potential key informant bias (Phillips, 1981).

In order to identify any self-selection bias we used league information to compare teams that participated vs. did not participate in the research. We found no differences between these groups. Furthermore, we applied Armstrong and Overton's (1977) time-trend extrapolation to address non-response bias. Based on the idea that participants who respond later are more similar to non-respondents, we analyzed differences between early and late respondents on the constructs of interest. Across variables, we only found one significant difference (shared goals) out of thirteen possible ones between early and late respondents ($p < .05$). Therefore, we are able to reasonably assume the lack of systematic bias in our data collection.

Measure Development

We derived all construct measures from existing scales, adapting them to the context of this study. Because we used different kinds of scales, we standardized the data before analysis. Scale items and sources are provided in the appendix. Based on the criteria suggested by Jarvis, MacKenzie and Podsakoff (2003), we assumed that the constructs cause the indicators, which corresponds to reflective measurements. The advantage of using reflective measures in covariance structure analysis is the ability to adjust for measurement error.

As the number of indicators per construct was very high for positive and negative anticipated emotions (six and seven, respectively), we employed a *partial disaggregation*

approach (Bagozzi & Edwards, 1998), combining them to produce three indicators per construct. Compared to models in which each item is a separate indicator, this approach results in a model with fewer parameters to estimate and reasonable ratios of cases to parameters.

In order to measure past, expected, and actual team performance, we first asked participants to list the most important successes of their team, which allowed us to document past performance from their own point of view. We checked the validity of these responses by comparing them with the ESL databases. Using this information, an independent expert team consisting of five professional computer gamers from five different teams helped us to evaluate the self-reported performance of the investigated teams. Next, we asked the teams if they have specific performance goals for the next six months, and invited them to describe three of these goals. On the basis of this information, the independent expert group helped us to evaluate the expected performance of teams. Finally, six months after the initial survey, we collected the final positions of teams in their league, and evaluated their actual performance using the same group of experts.

Data Analysis

In order to test the proposed model, we applied structural equation modeling based on covariance matrices (Cudeck, 1989), and analyzed all the proposed models using the Mplus 5.2 program. We assessed goodness-of-fit of the models with χ^2-tests, the Root Mean Square Error of Approximation (RMSEA), the Standardized Root Mean Square Residual (SRMR), the Tucker Lewis Fit Index (TLI), and the Comparative Fit Index (CFI). Further details regarding these indices can be found in Bentler (1990), and Marsh, Balla and Hau (1996). According to Hu and Bentler (1999), the overall fit of the model is satisfactory when the χ^2

test is not significant, all ML-based tests, such as TLI and CFI, are close to .95, SRMR is smaller than 0.08 and RMSEA is smaller than 0.06.[1]

Results

Measure Assessment

We assessed the reliability and validity of our constructs with multifactorial factor analyses. *Internal consistency* of constructs was evaluated using two measures: the composite reliability (ρ_ε) is an analogous measure with the α coefficient (Fornell & Larcker, 1981; Equation, 10; Bagozzi & Youjae, 1988), and the average variance extracted (AVE; $\rho_{VC(\xi)}$) estimates the amount of variance captured by a construct's measures relative to random measurement error (Fornell & Larcker 1981, Equation 11). A composite reliability ρ_ε above .60 and an average variance extracted $\rho_{VC(\xi)}$ above .50 indicate good internal consistency (Bagozzi & Youjae, 1988; Fornell & Larcker, 1981). As Table 1 shows, the values for all constructs are significantly greater than the stipulated criteria and denote good internal consistency.

[Insert Table 1 about here]

Additionally, we estimated a confirmatory factor analysis model with 13 latent constructs[2], and 27 measures. Results showed that the model fit the data well. The goodness-of-fit statistics for the model were as follows: $\chi^2(251) = 483.49$, $p < .001$, RMSEA = .04, SRMR = .03, CFI = .97, TLI=.96, which demonstrate a satisfactory fit. The standardized factor loadings ranged from .69 to .94 and were statistically significant at the $\alpha = .95$ level. This provides evidence that the constructs exhibited convergent validity.

[1] A statistical appendix with additional statistics may be requested from the authors.
[2] The three performance measures and the team tenure construct were operationalized as single-indicator variables with fixed variance for identification reasons.

We further evaluated discriminant validity of constructs using the widely-accepted procedure suggested by Fornell and Larcker (1981). The AVE ($\rho_{VC(\xi)}$) for each of the twelve factors was higher than the squared phi coefficient for any pair of two latent constructs, i.e. the highest variance that the factor shared with other factors in the model. These results are summarized in Table 1. As can be seen, the AVE extracted for each factor was always greater than the highest shared variance. As this criterion is satisfied, an inference error due to multicollinearity is also unlikely. Table 2 provides the correlations between constructs, corrected for measurement error.

[Insert Table 2 about here]

Finally, we checked for *common method variance.* Because all survey measures were collected with a common instrument, there is potential for method variance. To evaluate whether a single latent method factor could account for all manifest variables, we employed the latent methods factor suggested by Podsakoff, MacKenzie, Podsakoff and Lee (2003). These results are discussed in detail in the next section.

Structural model assessment

Considering the fit statistics for the full structural model [$\chi^2(293) = 378.89$, $p < .001$, RMSEA = .04, SRMR = .07, TLI = .95, and CFI = .96], the χ^2 is significant ($p < .05$) which is usually the case for large samples like the one we have. All other statistics are within their respective acceptable ranges, indicating a good model fit. Table 3 provides the standardized coefficients for the paths in the structural model.

[Insert Table 3 about here]

Hypotheses 1a-b consider the effects of team size on intra-team communication and team cohesion. Results revealed that one of the two paths, from team size to team cohesion (β = .008, p < .01) is small yet statistically significant, but there is no significant effect on intra-team communication. Note that this small positive path contradicts the direction posited in H1b.

Hypotheses 2a-b pertain to the effects of team tenure on intra-team communication and team cohesion. Only the path from team tenure to team cohesion is significant (β = .106, p < .01). Hypotheses 3a-b considering the effects of team heterogeneity on intra-team communication (β = .284, p < .001), and team cohesion (β = .169, p < .01) are both supported. Thus, for the impact of team demographics on team processes, hypotheses H2b, and H3a-b are validated, but H1a-b and H2a are not supported.

Hypotheses H4a-e concentrate on the effects of past performance on (a) communication (β = .079, *p* < .05), team cohesion (β = .085, *p* < .05), (b) (c1) shared goals to perform (β = .148, *p* < .001), (c2) shared desire to perform (β = .178, *p* < .001), (d) expected team performance (β = .073, *p* < .05), and (e) actual team performance (β = .158, *p* < .001). All of these paths are significant, supporting all five of the hypotheses H4a-e.

Hypotheses 5a-c investigate the impact of communication on (a) team cohesion (β = .502, *p* < .001), (b) shared goals to perform (β = .467, *p* < .001), and (c) shared desire to perform (β = .283, *p* < .001). Again, all paths are significant, validating the hypotheses H5a-c. Hypotheses 6a-b propose a positive impact of team cohesion on (a) shared goals to perform and (b) on shared desire to perform. Only the first path is significant (β = .153, *p* < .01), supporting H6a. Hypotheses 7a-b examine the relations between (a) positive anticipated emotions, and (b) negative anticipated emotions on shared desire to perform. Both paths are significant, supporting H7a (β = .219, *p* < .001) and H7b (β = .097[3], *p* < .05).

[3] We used reversed coding for negative anticipated emotions.

Hypotheses 8a-b consider the impacts of (a) shared desire to perform, and (b) shared goals to perform on we-intentions to perform. Both paths are significant, confirming H8a ($\beta = .863$, $p < .001$) and H8b ($\beta = .097$, $p < .001$). Overall, 77.7% of the variance in we-intentions to perform is explained by the investigated antecedents. Hypotheses 9 examines the effect of we-intentions to perform on expected team performance ($\beta = .539$, $p < .001$). This path is significant supporting H9. 23.7% of the variance in expected team performance is explained by its antecedents. Hypothesis 10 describes the impact of expected team performance on actual team performance. This path is significant as well ($\beta = .429$, $p < .001$) supporting H10. 24.9% of the variance in actual team performance is explained by its antecedents.

To further support the validity of our model, we tested those paths that are not part of the model using a series of χ^2-difference tests. Out of 36 possible paths tested, only one path emerged as significant (team size -> shared desire, $\chi_{Diff}^2(1) = 4.13$, $p = 0.042$). The remaining 35 paths were not significant, providing further support for the robustness of our proposed model.

Considering the different mediating effects in our model, we are in line with Iacobucci (2008) who considers that structural equation models with good model fits offer sufficient justification for the model. Nevertheless, we also calculated two tests on the significance of total indirect effects in our model:

(1) past performance - we-intention to participate: est./s.e. = 3.43, $p<0.001$;

(2) past performance - expected future performance: est/s.e. = 2.67, $p<0.01$).

Both were significant indicating that the mediators have significant meaning.

In addition, to rule out the effects of common method bias, we applied Podsakoff et al. (2003) latent methods factor approach. Applying this method, all the measures of the structural model hypothesized in Figure 1 were loaded on a single latent construct, allowing us to control for the portion of the variance that is attributable to the method. The results of

this re-estimation are provided in Table 3. As can be seen, some paths (such as the one from past performance to team cohesion) increased slightly in strength, whereas the path from past performance to expected team performance decreased slightly. Overall, the results were substantively similar, indicating that the pattern of significant relationships was not significantly affected by the common method bias.

Discussion

The positive impact of team demographics on team processes emphasizes the importance of selecting team members carefully (Elfenbein & O'Reilly III, 2007). As expected, team tenure has a positive effect on team cohesion. Additionally, the positive impact of team heterogeneity on team processes confirms the view that a bigger pool of skills and knowledge can significantly enhance team functioning (Lipnack & Stamps, 2000), especially in competitive environments requiring creativity and data integration. At the same time, communication between heterogeneous virtual team members can be very effective as long as the established interaction protocols are properly applied and respected (Lin et al., 2008).

Past performance represents an essential element for developing a dynamic, evolutionary model of virtual team functioning. In this study, past performance had a positive impact on team processes, strategic consensus, expected team performance and actual team performance. In managerial terms, past performance represents the feedback provided to team members. Using this information, team members are better able to evaluate their existing resources, strengths and weaknesses, establish more realistic future objectives, reach a more realistic strategic consensus, and plan effective operations for reaching performance objectives.

The findings indicate that team processes have a strong effect on both rational and emotional dimensions of strategic team consensus. However, team cohesion seems to affect

only the rational dimension of strategic consensus, which may be explained by the difficulty of defining and measuring team cohesion in a virtual team context (Curşeu, 2006). Furthermore, the direct influence of anticipated emotions on shared desire to perform provides a good explanation of the motivating factors that energize we-intentions to perform in highly competitive environments.

The output element of the IMOI model is characterized by expected and actual team performance. Our findings clearly indicate a direct influence of we-intentions to perform on expected team performance, which then affects the actual performance of investigated teams. However, the relationships between these variables are not yet clearly understood in virtual team functioning, requiring additional investigations of quantitative and qualitative nature.

Theoretical and managerial implications

The empirical investigation of competing virtual teams has considerable importance for the future development of group management theory and practice. This paper adds to the body of research seeking to investigate and understand the specific mechanisms that determine, influence and explain virtual team performance and effectiveness

The main theoretical implication of this study is the applicability of the IMOI model to the specific context of virtual teams competing in highly dynamic environments. However, the specific characteristics of virtual teams (geographically-dispersed team members, high team heterogeneity and computer-mediated communication) require theoretical and practical adaptations to the IMOI model. The effect of team size and heterogeneity on team processes is not yet fully understood, as the results of this paper contradict some of the previous studies on team performance. The importance of past performance feedback is clearly outlined by its direct influence on team processes, strategic consensus, expected team performance and actual team performance. Future studies should clarify these contradictions and investigate in

more detail the use of past performance feedback to effectively organize, motivate and coordinate virtual team members.

Another important contribution to group performance literature is the identified effect of strategic consensus on we-intentions to perform. The paper developed the concept of strategic consensus in virtual teams, considering both its emotional and rational dimensions, and investigated the impact of positive and negative anticipated emotions on shared desire to perform. The need to understand the role of emotions in motivating team members opens a fertile research area for leadership studies and managerial action (Tse & Dasborough, 2008). This topic is particularly important for managing virtual teams, considering the computer-mediated interaction between geographically-dispersed team members.

The IMOI model is also enriched by considering the effect of expected team performance between we-intentions to perform and actual team performance. Most existing studies do not take into account the connection between expected and actual team performance, although this can represent an essential feedback loop during team's operational functioning. Future studies should consider in more detail the link between past, expected and actual team performance to define the levers of managerial action that can be applied to enhance team's strategic orientation and effectiveness.

Concluding remarks

This study has some limitations because of its specific methodological approach. The population of study is represented by professional gaming teams, engaged in highly competitive environments characterized by homogeneous rules and procedures. The lack of organizational context eliminated the bias associated with diverse institutional structures, cultures and goals; but its downside is that this approach does not fully replicate the situation of virtual teams embedded in business organizations.

Our empirical analysis focused exclusively on developing and validating a complete version of the IMOI model, applied to virtual team functioning and performance. However, a number of team management issues have not been directly addressed in this article, such as team members' selection, trust, task dimensional factors, team training, conflict resolution, leadership and motivation. These topics should be considered in future research projects, to complement the theoretical and practical framework developed in this paper. Considering the specific characteristics of virtual teams, it is also necessary to consider the international and cultural heterogeneity of team members, and its influence on effective team functioning. Finally, it is important to integrate a temporal dimension in team performance studies, since both team structure and competitive environment continuously evolve in interaction with various external and/or internal elements.

References

Andrews, M.C., Kacmar, K.M., Blakely, G.L., & Bucklew, N.S. (2008). Group cohesion as an enhancement to the justice-affective commitment relationship. *Group & Organization Management, 33* (6), 736-755.

Armstrong, J. S., & Overton, T. S. (1977). Estimating non-response bias in mail surveys. *Journal of Marketing Research, 16*, 396-402.

Bagozzi, R. P. (2000). On the concept of intentional social action in consumer behavior. *Journal of Consumer Research, 27*, 388-396.

Bagozzi, R. (1992). The self-regulation of attitudes, intentions and behaviour. *Social Psychology Quarterly, 55*, 178-204.

Bagozzi, R., & Dholakia, U. (2002). Intentional social action in virtual communities. *Journal of Interactive Marketing, 16* (2), 2-21.

Bagozzi, R. P., & Edwards, J. R. (1998). A general approach for representing constructs in organizational research. *Organizational Research Methods, 1* (1), 45-87.

Bagozzi, R. P., & Youjae, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science, 16* (1), 74-94.

Baker, G. (2002). The effects of synchronous collaborative technologies on decision making: a study of virtual teams. *Information Resources Management Journal, 15* (4), 79-83.

Baruch, Y., & Holtom, B. (2008). Survey response rate levels and trends in organizational research. *Human Relations, 61* (8), 1139-1160.

Bateman, T.S., & Zeithaml, C.P. (1989). The psychological context of strategic decisions: a model and convergent experimental findings. *Strategic Management Journal, 10* (1), 59-74.

Bechtoldt, M.N., De Dreu, C.K.W., & Nijstad, B.A. (2007). Team personality diversity,

group creativity, and innovativeness in organizational teams. SUSDIV PAPER 1.2007. Retrieved May 2009 from http://www.feem.it/NR/Feem/resources/EURODIVPapers/SD2007-001.pdf.

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin, 107* (2), 238-246.

Bowers, C.A., Pharmer, J.A., & Salas, E. (2000). When member homogeneity is needed in work teams: A meta-analysis. *Small Group Research, 31*, 305-327.

Bradner, E., Mark, G., & Hertel, T.D. (2005). Team size and technology fit: Participation, awareness, and rapport in distributed teams. *IEEE Transactions on Professional Communication, 48* (1), 68-77.

Cannon-Bowers, J.A., Salas, E., & Converse, S.A. (1990). Cognitive psychology and team training: shared mental models in complex systems. *Human Factors Bulletin, 33*, 1-4.

Cudeck, R. (1989). Analysis of correlation matrices using covariance structure models. *Psychological Bulletin, 105*, 317-327.

Curşeu, P.L. (2006). Emergent states in virtual teams: a complex adaptive systems perspective. *Journal of Information Technology, 21*, 245-261.

DeSanctis, G., & Monge, P. (1999). Communication processes for virtual organizations. *Organization Science, 10*, 693-703.

Dess, G.G. (1987). Consensus on strategy formulation and organizational performance: Competitors in a fragmented industry. *Strategic Management Journal, 8*, 259-277.

Dess, G.G., & Priem, R.L. (1995). Consensus-performance research: Theoretical and empirical extensions, *Journal of Management Studies, 32* (4), 401-417.

Eisenhardt, K.M., & Schoonhoven, C.B. (1990). Organizational growth: Linking founding team, strategy, environment, and growth among U.S. semiconductor ventures, 1978-1988. *Administrative Science Quarterly, 35*, 504-529.

Elfenbein, H.A., & O'Reilly III, C.A. (2007). Fitting in: The effects of relational

demography and person-culture fit on group process and performance. *Group & Organization Management, 32* (1), 109-143.

Evans, C.R., & Jarvis, P.A. (1980). Group cohesion: A review and re-evaluation. *Small Group Behavior, 11*, 359-370.

Floyd, S.W., & Wooldridge, B. (1992). Managing strategic consensus: The foundation of effective implementation. *Academy of Management Executive, 6* (4), 27-39.

Frazier, M. L., Johnson, P. D., Gavin, M., Gooty, J. & Snow, D. B. (2010). Organizational justice, trustworthiness, and trust: A multifoci examination. *Group & Organization Management*, 35, 39-76.

Gibson, C.B., & Cohen, S.G. (eds.) (2003). *Virtual teams that work: Creating conditions for effective virtual teams effectiveness*. San Francisco: Jossey-Bass.

Gillam, C., & Oppenheim, C. (2006). Review articles: reviewing the impact of virtual teams in the information age. *Journal of Information Science, 32* (2), 160-175.

Hambrick, D.C., & Mason, P.A. (1984). Echelons: The organization as a reflection of its top managers. *Academy of Management Review, 9*, 193-206.

Han, T.W., & Williams, K.J. (2008). Multilevel investigation of adaptive performance: Individual- and team-level relationships. *Group & Organization Management, 33* (6), 657-584.

Hertel, G., Geister, S., & Konradt, U. (2005). Managing virtual teams: A review of current empirical research. *Human Resource Management Review, 15*, 69-95.

Hoffman, L.R., & Mayer, N.R.F. (1961). Quality and acceptance of problem solutions by members of homogeneous and heterogeneous groups. *Journal of Abnormal and Social Psychology, 62*, 401-407.

Hu, L.-T. & Bentler, P.M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6* (1), 1-55

Iaquinto, A.L., & Fredrickson, J.W. (1997). TMT agreement about the strategic decision process: A test of some of its determinants and consequences. *Strategic Management Journal, 18*, 63-75.

Ilgen, D. R., Hollenbeck, J. R., Johnson, M., & Jundt, D. (2005). Team in organizations: From input-process-output models to IMOI models. *Annual Review of Psychology, 56*, 517-543.

Jarvis, C. B., MacKenzie, S. B., & Podsakoff, P. M. (2003). A critical review of construct indicators and measurement model misspecification in marketing and consumer research. *Journal of Consumer Research, 30*, 199-217.

Kellermanns, F.W., Walter, J., Lechner, C., & Floyd, S.W. (2005). The lack of consensus about strategic consensus: Advancing theory and research. *Journal of Management, 31* (5), 719-737.

Knight, D., Pearce, C.L., Smith, K.G., Olan, J.D., Sims, H.P., Smith, K.A., & Flood, P. (1999). Top management team diversity, group process, and strategic consensus. *Strategic Management Journal, 20*, 445-465.

Kozlowski, S.W., Gully, S.M., Nason, E.R., & Smith, E.M. (1999). Developing adaptive teams: A theory of compilation and performance across levels and time. In D. R. Ilgen & E. D. Pulakos (Eds.), *The changing nature of work and performance: Implications for staffing, personnel actions, and development*, SlOP Frontiers Series (pp. 240-292). Jossey-Bass: San Francisco.

Kozlowski, S.W.J., & Ilgen, D.R. (2006). Enhancing the effectiveness of work groups and teams. *Psychological Science in the Public Interest, 7* (3), 77-124.

Jackson, B.G. (2000). A fantasy theme analysis of Peter Senge's Learning Organization. *The Journal of Applied Behavioral Science, 36* (2), 193-209.

Iacobucci, D. (2008). *Mediation analysis*. Thousand Oaks/CA: Sage.

Johansson, C., Dittrich, Y., & Juustila, A. (1999). Software engineering across boundaries:

Student project in distributed collaboration. *IEEE Transactions and Professional Communication, 42* (4), 286-296.

Langfred, C.W. (2000). Work-group design and autonomy – A field study of the interaction between task interdependence and group autonomy. *Small Group Research, 31* (1), 54-70.

LePine, J.A., Piccolo, R.F., Jackson, C.L., Mathieu, J.E., & Saul, J.R. (2008). A meta-analysis of teamwork processes: tests of a multidimensional model and relationships with team effectiveness criteria. *Personnel Psychology, 61*, 273-307.

Lim, B.-C., & Klein, K.J. (2006). Team mental models and team performance: A field study of the effects of team mental model similarity and accuracy. *Journal of Organizational Behaviour, 27*, 403-418.

Lin, C., Standing, C., & Liu, Y.-C. (2008). A model to develop effective virtual teams. *Decision Support Systems, 45*, 1031-1045.

Lin, C-P. (2010). Learning task effectiveness and social interdependence through the mediating mechanisms of sharing and helping: A survey of online knowledge workers. *Group & Organization Management*, 35, 299-328.

Lipnack, J., & Stamps, J. (2000). *Virtual teams, second edition*. New York: John Wiley and Sons.

Marks, M.A., Mathieu, J.E., & Zaccaro, S.J. (2001). A temporally based framework and taxonomy of team processes. *Academy of Management Review, 26* (3), pp. 356-376.

Marks, M.A., Zaccaro, S.J., & Mathieu, J.E. (2000). Performance implications of leader briefings and team-interaction training for team adaptation to novel environments. *Journal of Applied Psychology, 85*, 971-986.

Mathieu, J.E., Maynard, M.T., Rapp, T., & Gilson, L. (2008). Team effectiveness 1997-2007: A review of recent advancements and a glimpse into the future. *Journal of Management, 34* (3), 410-476.

Maznevski, M.L., & Chudoba, K.M. (2000). Bridging space over time: global virtual team dynamics and effectiveness. *Organization Science, 11* (5), 473-492.

McGrath**,** J.E. (1964). *Social Psychology: A brief introduction*. Holt, New York: Rinehart and Winston.

Michel, J.G., & Hambrick, D.C. (1992). Diversification posture and the characteristics of the top management team. *Academy of Management Journal, 35*, 9-37.

Norman, D.A. (1983). Some observations on mental models. In D. Gentner & A.L. Stevens (Eds.), *Mental models* (pp. 7-14). Hillsdale: Erlbaum.

O'Reilly, C.A.III, Caldwell, D.F., & Barnett, W.P. (1989) Work group demography, social integration, and turnover. *Administrative Science Quarterly, 34*, 21-37.

Passos, A.M., & Caetano, A. (2005). Exploring the effects of intragroup conflict and past performance feedback on team effectiveness. *Journal of Managerial Psychology, 20* (3/4), 231-244.

Perugini, M., & Bagozzi, R. (2002). The distinction between desires and intentions. *Working paper*, University of Essex, UK.

Perugini, M., & Bagozzi, R. P. (2001). The role of desires and anticipated emotions in goal-directed behaviours: broadening and deepening the theory of planned behavior. *British Journal of Social Psychology, 40*, 79-98.

Peters, L., & Karren, R.J. (2009). An examination of the roles of trust and functional diversity on virtual team performance ratings. *Group & Organization Management, 34* (4), 479-504.

Phillips, L.W. (1981). Assessing measurement error in key informant reports: a methodological note on organizational analysis in marketing. *Journal of Marketing Research, 18*, 395-415.

Pinsonneault, A., & Caya, O. (2005). Virtual teams: what we know and what we don't know. *International Journal of e-Collaboration, 1* (3), 1-16.

Podsakoff, P. M., MacKenzie, S. B., Podsakoff, N. P., & Lee, J.-Y. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88* (5), 879-903.

Rapert, M.I., Velliquette, A., & Garretson, J.A. (2002). The strategic implementation process. Evoking strategic consensus through communication. *Journal of Business Research, 55* (4), 301-310.

Robey, D., Khoo, H.M., & Powers, C. (2000). Situated learning in cross-functional virtual teams. *IEEE Transactions on Professional Communications, 43* (1), 51-66.

Salas, E., Stagl, K.C., Burke, C.S., & Goodwin, G.F. (2007). Fostering team effectiveness in organizations: Toward an integrative theoretical framework of team performance. In R.A.Dienstbier, J.W.Stuart, W. Spaulding & J. Poland (Eds.), *Modeling complex systems: Motivation, cognition and social processes*. Nebraska Symposium on Motivation, Vol. 51 (pp. 185-243). Lincoln: University of Nebraska Press.

Seidler, J. (1974). On using key informants: A technique for collecting quantitative data and controlling for measurement error in organization analysis. *American Sociological Review*, *39*, 816-831.

Shaw, M.E. (1981). *Group Dynamics: The Psychology of Small Group Behavior*, 3rd ed. New York: McGraw-Hill.

Smith, K.G., Smith, K.A., Olian, J.D., Sims H.P.Jr., O'Bannon, D.P., & Scully, J.A. (1994). Top management team demography and process: The role of social integration and communication. *Administrative Science Quarterly, 39*, 412-438.

Stewart, M.M., & Johnson, O.E. (2009). Leader-member exchange as a moderator of the relationship between work group diversity and team performance. *Group & Organization Management, 34* (5), 507-535.

Tekleab, A.G., Quigley, N.R., & Tesluk, P.E. (2009). A longitudinal study of team conflict,

conflict management, cohesion, and team effectiveness. *Group & Organization Management, 34* (2), 143-169.

Tse, H.H.M., & Dasborough, M.T. (2008). A study of exchange and emotions in team member relationships. *Group & Organization Management, 33* (3), 243-268.

Tuomela, R. (1995). *The importance of us: A philosophical study of basic social notions*. Stanford: Stanford University Press.

Tuomela, R., & Tuomela, M. (2005). Cooperation and trust in group context. *Mind and Society, 4*, 49-84.

Wagner, W.G., Pfeffer, J., & O'Reilly, C.A.III (1984). Organizational demography and turnover in top management groups. *Administrative Science Quarterly, 29*, 74-92.

Warkentin, M., & Beranek, P.M. (1999). Training to improve virtual team communication. *Information Systems Journal, 9*, 271-289.

Welbourne, T.M., Johnson, D.E., & Erez, A. (1998). The role-based performance scale: Validity analysis of a theory-based measure. *Academy of Management Journal, 41*, 540-555.

Whyte, G. (1989). Groupthink reconsidered. *Academy of Management Review, 14* (1), 40–56.

Wooldridge, B., & Floyd, S.W. (1990). The strategy process, middle management involvement, and organizational performance. *Strategic Management Journal, 11*, 231-241.

Wong, S.-S., & Burton, R.M. (2000). Virtual teams: What are their Characteristics, and Impact on Team Performance. *Computational & Mathematical Organization Theory, 6*, 339-360.

Zenger, T.R., & Lawrence, B.S. (1989). Organizational demography: The differential effects of age and tenure distributions on technical communication. *Academy of Management Journal, 32*, 353-376.

FIGURE 1: Hypothesized Model

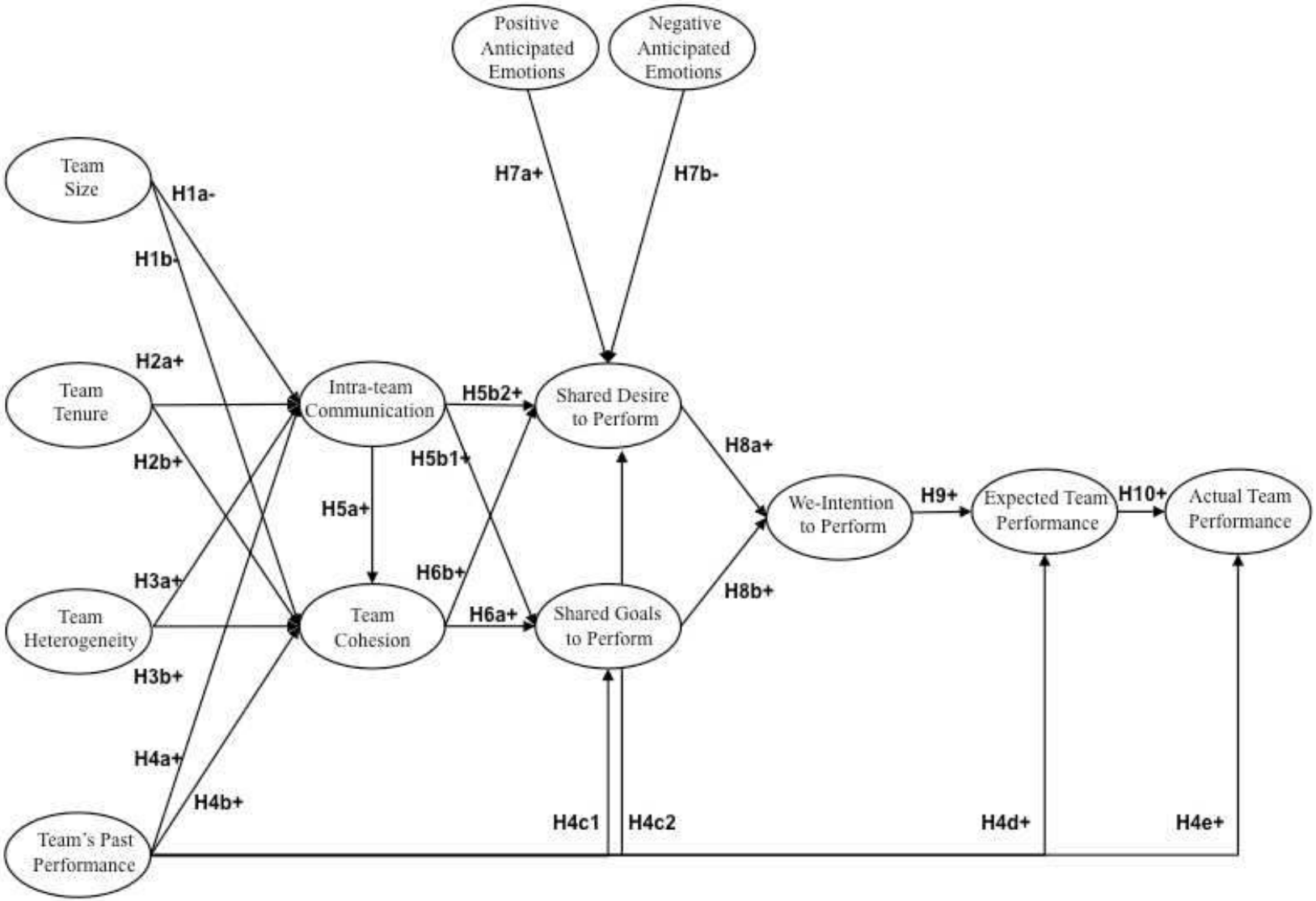
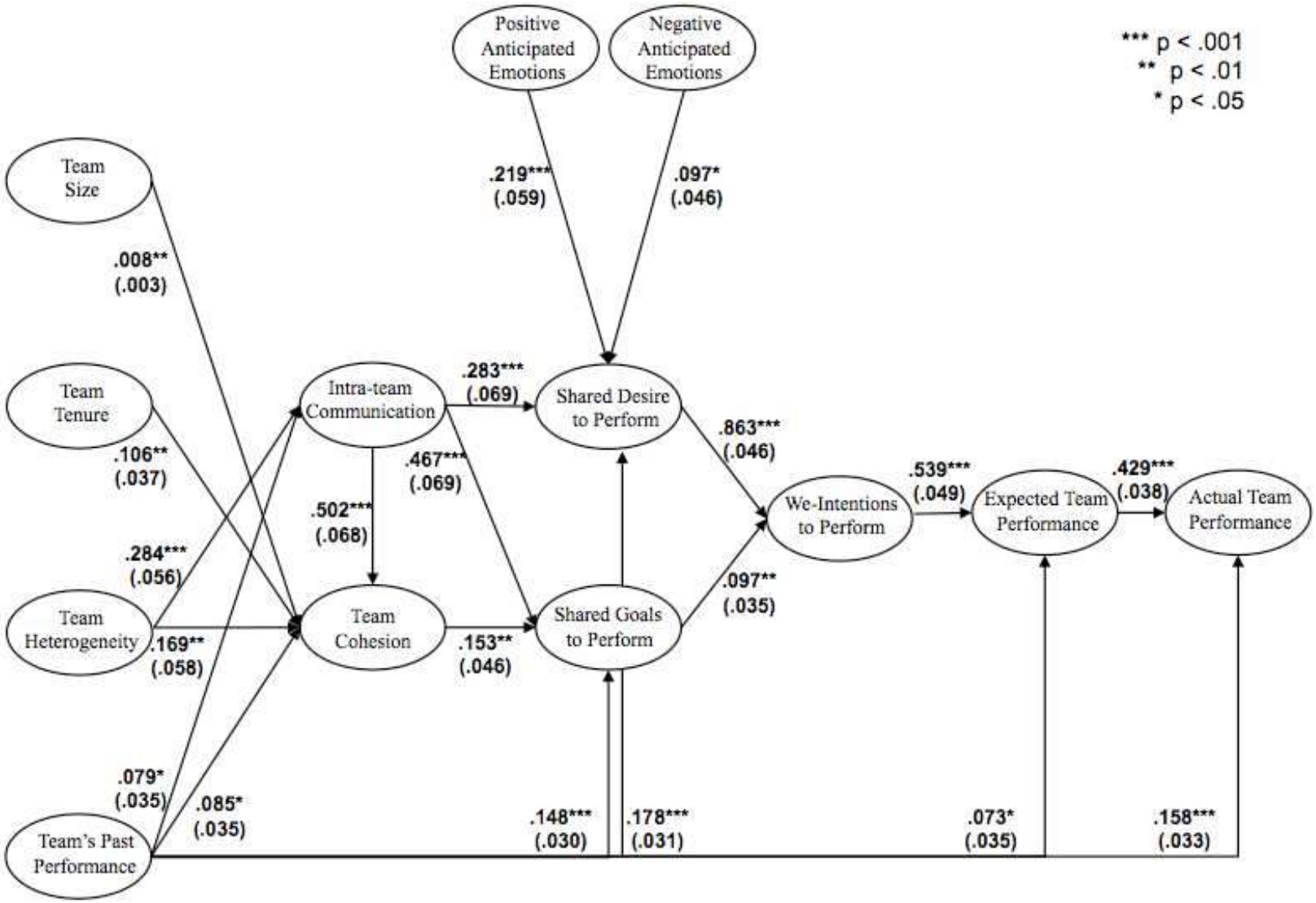


FIGURE 2: Estimated Model



Notes: The unstandardized coefficients and standard errors are in parentheses; insignificant paths are omitted for ease of exposition.

TABLE 1
Means, Standard Deviations, Reliabilities, and Internal Consistency Statistics for Construct Measures

Construct	Number of Measures	Mean	Std. Dev.	Alpha	Composite Reliability (ρ_{ε})	AVE ($\rho_{VC(\xi)}$)	Highest shared variance
Team size	1	24.10	22.20	-	-	-	-
Team tenure	1	20.92	20.03	-	-	-	-
Team heterogeneity	2	4.49	1.43	.814	.811	.682	.172
Past performance	1	3.39	1.14	-	-	-	-
Intra-team communication	2	5.77	1.36	.722	.657	.545	.343
Team cohesion	4	4.10	.86	.931	.854	.762	.349
Positive anticipated emotions	6	5.03	1.12	.870	.764	.652	.138
Negative anticipated emotions	7	3.31	1.60	.927	.833	.774	.097
Shared desire	2	5.14	1.61	.826	.740	.693	.615
Shared goals	3	5.23	1.31	.856	.762	.649	.249
We-intentions to perform	3	4.25	1.21	.896	.799	.717	.400
Expected performance	1	3.36	1.35	-	-	-	-
Actual performance	1	2.80	1.23	-	-	-	-

TABLE 2
Φ Matrix of Latent Constructs in Theoretical Framework for Full Sample (N = 583)

	HET	PPER	COM	COH	PEM	NEM	DES	SG	WIN	EPER	APER
HET	1										
PPER	-.149*	1									
COM	.247*	.091*	1								
COH	.228*	.149*	.486*	1							
PEM	.226*	-.007	.093*	.112*	1						
NEM	-.005	.004	.008	.006	.241*	1					
DES	.081	.272*	.326*	.235*	.235*	.142*	1				
SG	.117*	.266*	.536*	.413*	.058	.005	.237*	1			
WIN	.081	.258*	.330*	.240*	.207*	.122*	.877*	.298*	1		
EPER	.025	.202*	.159*	.123*	.094*	.056	.425*	.159*	.480*	1	
APER	-.016	.268*	.085*	.080	.039	.025	.232*	.116*	.253*	.466*	1

*Coefficients are significant at $\alpha = .05$ level; Note: All correlations are significantly less than 1.00; HET=team heterogeneity; PPER=past performance; COM=intra-team communication; COH=team cohesion; PEM=positive anticipated emotions; NEM=negative anticipated emotions; DES=shared desire to perform; SG=shared goals to perform; WIN= we-intentions to perform; EPER=expected performance; APER=actual performance

TABLE 3
Results of the Hypotheses Testing: Standardized Structural Model Coefficients

Path	Not controlling for method bias	Controlling for method bias
	N=583	N=583
SI → PPER	.125	.002
SI → COM	.148	.001
SI → COH	.200**	.006*
TEN→ PPER	.047	.041
TEN→ COM	-.073	-.050
TEN→ COH	.115**	.107**
HET → PPER	-.140**	-.154*
HET → COM	.299***	.301***
HET → COH	.147**	.149**
PPER → COM	.115*	.083*
PPER → COH	.104*	.095**
PPER → DES	.242***	.174***
PPER → SG	.201***	.144***
PPER → EPER	.084*	.066
PPER →APER	.181***	.142***
COM → COH	.418***	.520***
COM →DES	.262***	.293***
COM → SG	.434***	.456***
COH → SG	.172***	.148***

PEM → DES	.184***	.124*
NEM → DES	.095*	.091
DES → WIN	.854***	.854***
SG → WIN	.095**	.098**
WIN → EPER	.459***	.536***
EPER → APER	.430***	.423***

*p < .05; **p < .01; ***p < .001; Notes: SI=team size; TEN=team tenure; HET=team heterogeneity; PPER=past performance; COM=intra-team communication; COH=team cohesion; PEM=positive anticipated emotions; NEM=negative anticipated emotions; DES=shared desire to perform; SG=shared goals to perform; WIN= we-intentions to perform; EPER=expected performance; APER=actual performance

APPENDIX 1
SUMMARY OF SURVEY CONSTRUCTS AND THEIR MEASURES

Team size (one measure)

- If you consider the size of your team, how many team members do you have? _____ members.

Team tenure (one measure)

- How long has your team been together for playing this online game? _____ months.

Team heterogeneity (two measures)

- In selecting new players for your team, on which characteristic does your team focus more, skills or team-player orientation? (1-Skills are much more important to my team; 4-Both characteristics are equally important to my team; 7-Team player orientation is more important to my team).
- Imagine your team lost several games with different opposing teams. In this case, if you had to replace one of your team members, on which characteristic would your team focus more, skills or team-player orientation, in selecting a new team member? (1-Skills would be more important to my team; 4-Both characteristics would be equally important to my team; 7-Team player orientation would be more important to my team).

Intra-team communication (two measures), following Smith et al. (1994)

- We talk to each other extensively during practice sessions. (1-Does not describe our team at all; 7-Describes our team completely).
- We communicate extensively via electronic chat or audio with one another during practice sessions. (1-Does not describe our team at all; 7-Describes our team completely).

Team cohesion (four measures), adapted from O'Reilly et al. (1989)

- How strongly do team members like their team mates? (1-Do not like at all; 5-Like very much).
- How much attracted are team members by their team? (1-Not attracted at all; 7-Very much attracted).
- How satisfied are team members with their team? (1-Not satisfied at all; 7-Very satisfied).
- We discuss our objectives with each other extensively during practice sessions (1-Does not describe our team at all; 7-Describes out team completely).

Positive anticipated emotions (six measures), adapted from Perugini & Bagozzi (2001)

When we are anticipating our next online practice or match game with our team, we experience (1-Not at all; 4-Moderately; 7-Very much):

- Contentment
- Excited
- Delighted
- Happy
- Satisfied
- Self-assured

Negative anticipated emotions (seven measures), adapted from Perugini & Bagozzi (2001)

When we are anticipating our next online practice or match game with our team and consider the possibility of not being able to play with our team, we experience (1-Very much; 4-Moderately; 7-Not at all), reverse-coded:

- Angry
- Frustrated
- Sad

- Disappointed
- Worried
- Uncomfortable
- Anxious

Shared desire to perform (two measures), adapted from Perugini & Bagozzi (2001)

- We desire to play together online with our team in an online gaming tournament in the next six months. (1-Disagree; 4-Neither agree nor disagree; 7-Agree).
- We desire for playing in an online gaming tournament together with our team in the next six months can be described as: (1-No desire at all; 4-Moderate desire; 7-Very strong desire)

Shared goals to perform (three measures)

- Everyone in our team shares the same goals concerning online gaming. (1-Disagree completely; 4- Neither agree nor disagree; 7-Agree completely).
- Our team is very good when it comes to setting the same goals concerning online gaming. (1-Does not describe our team at all; 7-Describes our team completely).
- All of us in the team work towards the same goals concerning online gaming. (1-Disagree completely; 4- Neither agree nor disagree; 7-Agree completely).

We-intentions to perform (three measures), adapted from Bagozzi (2000)

- How likely is it that you will play in an online gaming tournament with your team in the next six months? (1-Extremely unlikely; 4-Neither likely nor unlikely; 7-Extremely likely).
- I intend that our team play together in an online gaming tournament within the next six months. (1-Strongly disagree; 3-Neither agree nor disagree; 7-Strongly agree).
- We (i.e., my team and I) intend to enter and play in an online gaming tournament within the next six months. (1-Strongly disagree; 3-Neither agree nor disagree; 7-Strongly agree).

Past performance (one measure)

- Please, list some of your most important, past success in your actual team in the following, e.g. winning a tournament, position in a league, nomination of national team players.

Expected performance (one measure)

- Does your team have specific goals concerning online gaming that the team would like to accomplish in the next six months? (yes; no)
- If you answered yes, what are your teams' expected, specific goals regarding online gaming? (e.g. league position,… please list up to three specific goals below).

APPENDIX 2
SUMMARY OF MEASURES IN SECONDARY DATA COLLECTION

Team size (one measure)

- Official team size at the official ESL league page.

Past performance (one measure)

- Based on the past performance measure in the survey.
- Experts evaluated the self-mentioned performance using the question: When compared to other online gaming teams, would you consider this team to be (choose one of the options below): (1-Not successful at all; 4-Moderately successful; 7-Very successful).

Expected performance (one measure)

- Based on the expected future performance measure in the survey.
- Experts evaluated the self-mentioned expected performance using the question: When compared to other online gaming teams, would you consider this team to be (choose one of the options below): (1-Not ambitious at all; 4-Moderately ambitious; 7-Very ambitious).

Actual performance (one measure)

- Final league ranking at the end of the season.
- Experts evaluated the team ranking at the end of the season using the question: When compared to other online gaming teams, would you consider this team was (choose one of the options below): (1-Not successful at all; 4-Moderately successful; 7-Very successful).